

Appl. No. 09/639,636
Amdt. Dated 5 December 2003
Reply to Office action of 10 October 2003

As can be seen from FIG. 5, designation of angle "S", and page 7, lines 5-13, of the Specification, Applicants were measuring the 0.25 degrees off an axis orthogonal to substrate 114. A "slope" of 0 to .25 degrees as defined by Applicants would correspond to an angle of 89.75 to 90 degrees with respect to the plane of the substrate. Applicants cannot determine which axis the Lambda range refers to. However, in 20-75 does not fall within either 0-0.25 or 89.75-90.

Pages 6-8 of the Lambda reference relate to ink jet nozzles and indicate that a 90 mm long axis by 3 mm short axis with a steep slope is desirable. It is simple to state that steep slopes are desirable. However, these slopes are difficult to obtain.

In Applicants' invention, the high power laser, the phase mask and the conditioning work together to maximize the amount of laser light that reaches the substrate and minimize the wasted light as well as the opportunity for successful x-ray grid substrate fabrication. Applicants' combination of the elements of claim 10 provides a commercially feasible system for ablating the x-ray grid substrate with the desired slopes by maximizing the utilization of available power.

Applicants made similar remarks to those listed in the preceding four paragraphs in a response mailed 6 May 2003. The Office action (pages 5-6) statement responded to these arguments as follows:

[T]he claims argue of an angle of less or equal to 0.25 degrees. This wall range includes 0 degrees or no slope to the wall and thus the wall ranges taught by Lambda would be unnecessary, since the laser placed in a perpendicular angle to the substrate would form the necessary opening with no slope. Additionally, Lambda teaches about the 'shallow angles' of the slope. The applicants argument about the angles and slope in relation to the plane of reference does not address the rejection since the claimed invention only claims the slopes being less than or equal to 0.25 degrees. There are no further referencing about this plane of reference. In regards to the thickness, the energy provided for the 50 micrometer thick substrate is set at a range of 30-50 mJ/cm², and later in the same column on page 8, as pointed out by the applicant, Lambda discusses the use of 800 mJ/cm² for the laser. In correlation to the energy expenditure of the laser, this would enable for use in a substrate thickness of 800 micrometers, including the range of the expressed by the claims of 300 to 1500 micrometers.

Applicants respectfully submit however, that the relation between energy density (fluence) and thickness penetration capacity is not linear. In other words, increasing laser power by a factor of X does not result in that same factor of material thickness penetration.

Further, Applicants reiterate that neither of the Lambda reference examples relate to x-ray grid substrates which require ability to ablate openings which are significantly narrower than the substrate thickness (Applicants' Specification, page 2, lines 28-30, which describes typical x-ray grid ratios in the range of 4:1 and 16:1). In the Lambda reference, the hole on page 8 is shown as having a diameter of about 50 micrometers and a distance of 50 micrometers which results in an thickness/diameter ratio of 1:1. In contrast, as described in Applicants' specification, on page 7, lines 5-13, Applicants were able to achieve a thickness of 1.5 millimeters and a diameter of 107 micrometers (with the resulting ratio of 14:1).

Accordingly, Applicants respectfully submit that the claimed invention defines allowable subject matter over the applied art. Withdrawal of the rejection of claim 10, and claims 11 and 15-17 which depend therefrom, is respectfully requested.

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Claim 12

Claim 12 was rejected under 35 USC 103(a) on Lambda Physik Industrial Report in view of Konishi. Claim 12 depends from claim 10 which Applicants believe to be in condition for allowance over Lambda for the reasons discussed above regardless of whether Konishi might be interpreted to teach or suggest an axial gradient-index lens. Accordingly, Applicants respectfully submit that claim 12 defines allowable subject matter over Lambda and Konishi.

Claims 18-21

Applicants respectfully traverse the rejection of claims 18-21 under 35 USC 103(a) over Lambda Physik Industrial Report in view of Guida et al., US Patent No. 5,557,650. Applicants respectfully submit that Lambda does not teach or disclose the claim 18 recitations of (with emphasis added):

18 (previously presented). A system for fabricating an anti-scatter x-ray grid for medical diagnostic radiography, the system comprising:

a sub-system for providing a high laser beam fluence with low beam divergence, the sub-system including (a) a phase mask between a substantially transparent substrate and a high power laser and (b) a beam homogenizer for conditioning the laser beam to optimize utilization of beam energy delivered by the laser;

means for ablating portions of the substrate through the phase mask with the conditioned laser beam;

means for filling the ablated portions of the substrate with a substantially absorbent material; and

means for removing additional portions of the substrate while permitting selected portions of the substrate to remain.

As stated in the Office Action, Lambda does not relate to filling ablated portions and removing additional substrate portions while permitting selected substrate portions to remain. Applicants again submit that Guida's substrate polishing "to remove stray metal" is not "removing additional portions of the substrate" in the sense described in claim 18.

Applicants made similar arguments to the preceding paragraph in the Response mailed 6 May 2003. The "Body" of the present Office Action (page 5) includes a new statement that "Lambda teaches ... etching techniques for removing debris after laser ablation forms the patterns."

However, Applicants continue to assert that removing "debris" also does not teach suggest or disclose "removing additional portions of the substrate" in the sense described in claim 18. What is claimed in claim 18, described on page 6, lines 1-5, and shown in FIG. 4, is removal of pieces 115 of the substrate itself and not merely stray or debris metal situated therein.

Thus, even if the references were to be combined, the result would still not teach or suggest the claim 18 recitations.

The "Response to Remarks" portion of the Office action (page 6) statement regarding claim 18 reads as follows:

In regards to the arguments concerning Lambda in view of Guida, Lambda further claims of plasma-assisted etching techniques that is formed after laser ablation thereby forming the means for further removing additional portions of the substrate.

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Applicants again traverse the characterization of removing debris as being "removing additional portions" and submit that this Office action comment does not address Applicants' distinction between "debris" which is not really part of the substrate itself and true parts of the substrate as recited in claim 18.

Accordingly, Applicants respectfully submit that the claimed invention defines allowable subject matter over the applied art. Withdrawal of the rejection of claim 18 and claims 19-21 which depend therefrom is respectfully requested.

Summary

In view of the foregoing, Applicants respectfully submit that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are respectfully requested.

Should the Examiner believe that anything further is needed to place the application in even better condition for allowance, the Examiner is requested to contact Applicants' undersigned representative at the telephone number below.

Respectfully submitted,

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